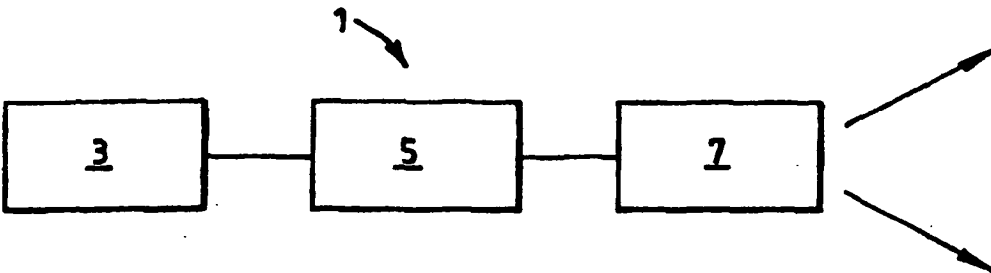


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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>G01S 13/93</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/15845</b> <b>(43) International Publication Date:</b> 16 April 1998 (16.04.98)
<b>(21) International Application Number:</b> PCT/GB97/02671 <b>(22) International Filing Date:</b> 29 September 1997 (29.09.97)  <b>(30) Priority Data:</b> 9620826.9      5 October 1996 (05.10.96)      GB  <b>(71) Applicant (for GB IE only):</b> FORD MOTOR COMPANY LIMITED [GB/GB]; Eagle Way, Brentwood, Essex CM13 3BY (GB).  <b>(71) Applicant (for DE only):</b> FORD WERKE AG [DE/DE]; Werk Köln-Niehl, Henry-Ford-Strasse, Postfach 60 04 02, D-5000 Köln 60 (DE).  <b>(71) Applicant (for FR MC only):</b> FORD FRANCE S.A. [FR/FR]; Boite postale 307, F-92506 Rueil-Malmaison Cedex (FR).  <b>(71) Applicant (for AT BE CH DK ES FI GR IT JP LU NL PT SE only):</b> FORD MOTOR COMPANY [US/US]; The American Road, Dearborn, MI 48126 (US).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> SMITH, Graeme, Peter [GB/GB]; 11 Clover Avenue, Bichops Stortford, Herts CM23 4BW (GB).		<b>(74) Agent:</b> MESSULAM, Alec, Moses; A. Messulam & Co., 24 Broadway, Leigh on Sea, Essex SS9 1BN (GB).  <b>(81) Designated States:</b> JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> AUTOMATIC COLLISION NOTIFICATION    <b>(57) Abstract</b>  An improved automatic collision notification system (1) comprising a radar sensing system (3) including at least one radar transmitter and receiver arranged to detect the presence of an object in a predetermined area relative to the vehicle (4) and to detect the velocity and direction of movement of the object relative to the vehicle (4), a collision prediction unit (5) coupled to the radar sensing system (3) which calculates the impact velocity of the impending collision to provide an accident severity indicator, the collision prediction unit (5) being coupled to an accident notifier (7) arranged to transmit a signal (13) receivable at a station (15) remote from the vehicle (4), the signal emitted transmitting the information that a collision has occurred and the severity of the collision.		

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## AUTOMATIC COLLISION NOTIFICATION

Field of the Invention

5 The invention relates to an automatic collision notification system, the invention being applicable with particular advantage to motor vehicles.

A number of systems have recently been proposed which  
10 include an in car transmitter, arranged to emit an emergency signal in the event of an accident. Typically the emergency signal is transmitted to the emergency services, in particular the police. These are known under a number of names including 'Emergency Call', 'MayDay' and 'VEMS'. Such  
15 systems typically link with signals from Global Positioning Satellites (GPS) often used in in-car navigational systems, to give the emergency services the ability to pinpoint the location of the vehicle accurately. Typically such systems emit a signal on actuation of an airbag, since this is an  
20 indicator that some impact has occurred. However it is possible that airbags can be actuated when the accident is not severe, where there are no other road users involved, and where the attendance of the emergency services is not strictly necessary.

25 A number of radar systems have been proposed for installation in motor vehicles for detecting objects around a vehicle. Transmitters and receivers are mounted upon the vehicle to detect the presence or approach of objects in a  
30 particular direction to be used to help to warn an occupant of a potential collision. Typically, such systems have been developed for collision warning and parking.

Summary of the Invention

35

According to the invention there is provided an improved automatic collision notification system comprising a radar

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sensing system including at least one radar transmitter and receiver arranged to detect the presence of an object in a pre-determined area relative to the vehicle and to detect the velocity and direction of movement of the object

5 relative to the vehicle, a collision prediction unit coupled to the radar sensing system which calculates the impact velocity of the impending collision to provide an accident severity indicator, the collision prediction unit being coupled to an accident notifier arranged to transmit a  
10 signal receivable at a station remote from the vehicle, the signal emitted transmitting the information that a collision has occurred and the severity of the collision.

Thus this system ensures that the information passed on to  
15 the emergency services is fuller and gives them a more complete picture. This could reduce the possibility of trivial call-outs and higher prioritisation for high severity accidents.

20 The system according to the invention can be provided as a separate unit to the commercially available systems or can be incorporated into the systems available for emergency Call-up on accident occurrence as an add-on providing further information. Preferably the collision prediction  
25 unit also calculates the trajectory of the impact.

The predetermined area in relation to the vehicle in which the presence of an object is to be detected depends on the nature of the vehicle. However to be comprehensive, this  
30 will have to encompass an envelope surrounding the vehicle.

Preferably the system includes at least two radar transmitters and receivers, which are impulse radar transmitters and receivers. In this context the term  
35 'impulse radar' is intended to encompass any radar signal of short radio frequency without a carrier wave, and includes radar sometimes referred to as 'broadband radar'. A typical

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impulse radar sensing system is described in published specification WO90/13048.

5 Such a system can be used to track accurately the path of an object outside the vehicle to accurately predict the potential of a collision, its likely position and time before impact.

10 Although the radar sensing system may be used in a vehicle, purely for use in the automatic collision notification system, the invention is applicable with particular advantage to a vehicle in which the radar sensing system is used also for providing driver information and warnings, such as a parking aid. The advantage is that the same  
15 sensors are multifunctional.

Preferably the radar sensing system is part of a collision warning system as described in copending PCT application number GB97/01728. Such a system is able to look around the  
20 vehicle to detect obstacles about the vehicle and to use the signals detected in a number of collision warning modes.

#### Brief Description of the Drawings

25 An automatic collision notification system in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

30 Figure 1 is a schematic illustration of a typical collision warning system;

Figure 2 is a schematic block diagram of the automatic collision notification system;

35

Figure 3 is a schematic view of the predetermined area scanned by the radar receiver; and,

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Figure 4 is a schematic plan view of a vehicle illustrating the position of the sensors and receivers.

5 Description of the Preferred Embodiment

The automatic collision notification system 1 illustrated in the drawings comprises a radar sensing system 3 including at least one radar transmitter and receiver arranged to detect  
10 the presence of an object in a predetermined area relative to the vehicle 4 and to detect the velocity and direction of movement of the object relative to the vehicle 4, a collision prediction unit 5 coupled to the radar sensing system 3 which calculates the impact velocity of the  
15 impending collision to provide an accident severity indicator, the collision prediction unit 5 being coupled to an accident notifier 7 arranged to transmit a signal receivable at a station remote from the vehicle, the signal transmitting the information that a collision has occurred  
20 and the severity of the collision.

Here the collision prediction unit 5 also calculates the trajectory of the impact.

25 The radar system 3 comprises four sensors 9 shown in figure 3 mounted at the corners of the vehicle in the region of the bumper. Each sensor 9 comprises an impulse radar transmitter and receiver. This arrangement of four sensors allows the envelope around the vehicle to be monitored.

30 The radar sensing system monitors continually the zones of concern illustrated in figure 3 for intrusion by other vehicles or other obstacles. The predetermined areas are front of vehicle, rear of vehicle, drivers side and  
35 passenger side. The sensors 9 are used in pairs to track the trajectory of targets within their field of view. Time to impact is calculated using knowledge of relative velocities

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of the vehicle and target. This information is then fed to the collision prediction unit 5.

5 As illustrated in figure 1, the location of the vehicle 4 is pinpointed by a Global Positioning Satellite 11 which produces a signal 13 part of which pinpoints the position of the vehicle which is transmitted from the vehicle 4 to a central receiving antenna 15 which transmits relevant information to the emergency services 17.

10

In this case the collision notification system 1 is part of an existing system, VEMS ( although it could equally be part of the Emergency Call or MayDay systems also available). Such a system is arranged to send a signal forming part of the signal 13 transmitted to the antenna 15, on actuation of the airbag to indicate that an accident has occurred.

20 The signal 13 also includes a signal which indicates the severity of the collision so that the emergency services are given as full a picture as possible, with the fact that an accident has occurred, an indicator of severity and the location of the accident.

25 This helps the emergency services to provide aid quickly and efficiently without needing to await a report of the accident.

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Claims

1. An improved automatic collision notification system 1 comprising a radar sensing system 3 including at least one  
5 radar transmitter and receiver arranged to detect the presence of an object in a pre-determined area relative to the vehicle 4 and to detect the velocity and direction of movement of the object relative to the vehicle 4, a collision prediction unit 5 coupled to the radar sensing  
10 system 3 which calculates the impact velocity of the impending collision to provide an accident severity indicator, the collision prediction unit 5 being coupled to an accident notifier 7 arranged to transmit a signal 13 receivable at a station 15 remote from the vehicle 4, the  
15 signal emitted transmitting the information that a collision has occurred and the severity of the collision.
2. A system according to claim 1, in which the collision prediction unit 5 also calculates the trajectory of an  
20 impact.
3. A system according to claim 1 or 2, in which the radar sensing system 3 includes at least two impulse radar transmitters and receivers.  
25
4. A system according to any one of the preceding claims, in which the radar sensing system 3 is also used for providing driver information and warnings.

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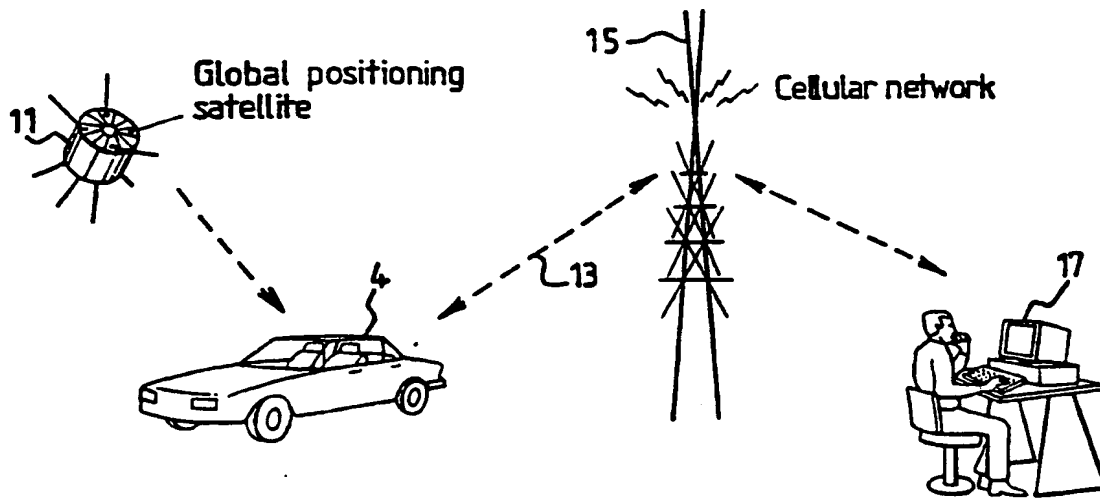


FIG. 1

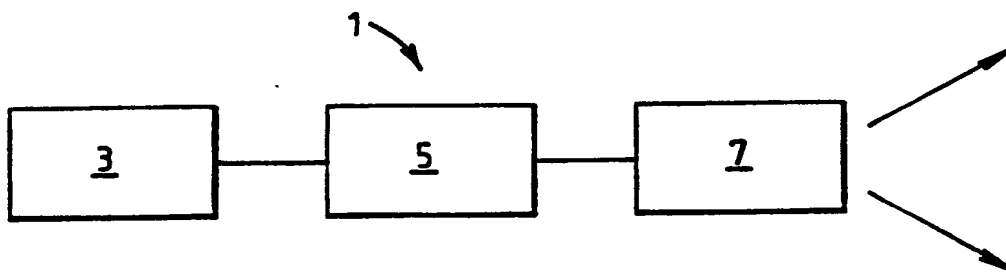


FIG. 2

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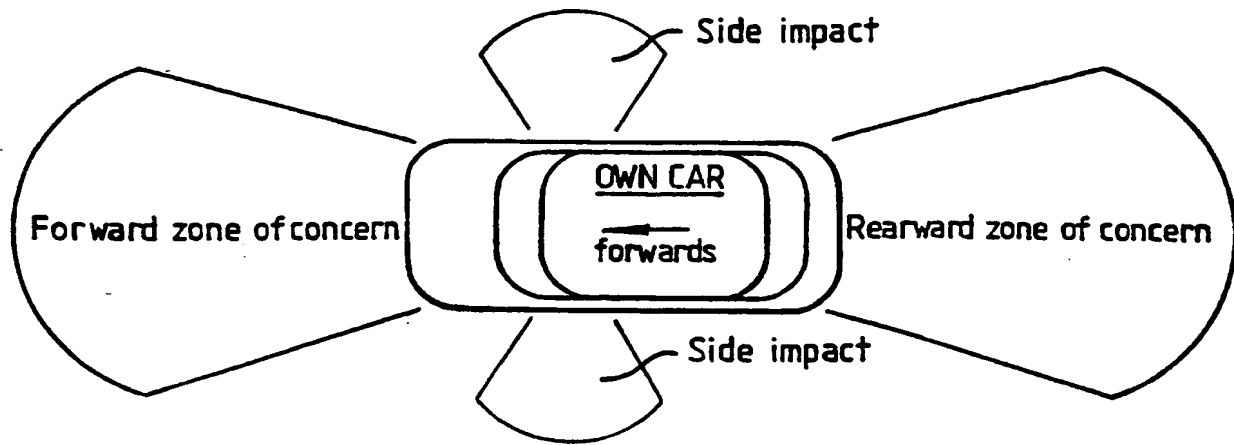


FIG. 3

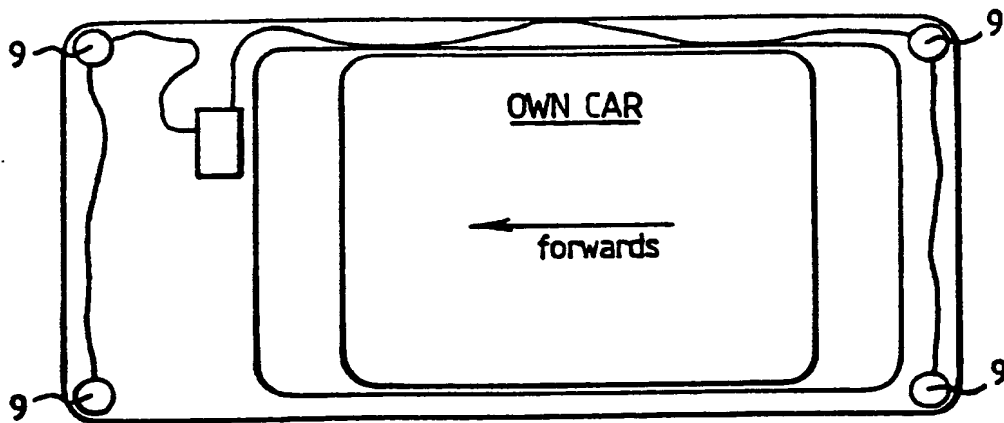


FIG. 4

# INTERNATIONAL SEARCH REPORT

Inten. .nal Application No  
PCT/GB 97/02671

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G01S13/93

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G01S G08G B60R H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 515 043 A (BERARD ALFREDO J ET AL) 7 May 1996 see column 2, line 36 - line 52; figure 2 see column 3, line 44 - line 63 ---	1-4
Y	US 5 555 286 A (TENDLER ROBERT K) 10 September 1996 see abstract; figure 1 see column 2, line 41 - line 67 ---	1-4
Y	AJLUNI C: "ITS: THE BRIDGE TO AN INTERMODAL SOCIETY" ELECTRONIC DESIGN, vol. 43, no. 20, 2 October 1995, page 85/86, 88, 90, 92, 94/95 XP000550495 see page 90, left-hand column, line 9 - line 14; figure 5 ---	1-4
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Date of the actual completion of the international search

9 January 1998

Date of mailing of the international search report

28. 01. 98

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information on patent family members

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